European Physical Journal B 2008 vol.66 N2, pages 155-163

19F nuclear spin relaxation and spin diffusion effects in the single-ion magnet LiYF 4:Ho 3+

Malkin B., Vanyunin M., Graf M., Lago J., Borsa F., Lascialfari A., Tkachuk A., Barbara B.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

Temperature and magnetic field dependences of the 19F nuclear spin-lattice relaxation in a single crystal of LiYF 4 doped with holmium are described by an approach based on a detailed consideration of the magnetic dipole-dipole interactions between nuclei and impurity paramagnetic ions and nuclear spin diffusion processes. The observed non-exponential long time recovery of the nuclear magnetization after saturation at intermediate temperatures is in agreement with predictions of the spin-diffusion theory in a case of the diffusion limited relaxation. At avoided level crossings in the spectrum of electron-nuclear states of Ho 3 + ions, rates of nuclear spin-lattice relaxation increase due to quasi-resonant energy exchange between nuclei and paramagnetic ions in contrast to the predominant role played by electronic cross-relaxation processes in the low-frequency ac-susceptibility.

http://dx.doi.org/10.1140/epjb/e2008-00411-7